

# NAVAL MEDICAL RESEARCH AND DEVELOPMENT

# NEWS

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## Clinical Research Nurses at NMRC Clinical Trials Center Forge Ahead to Evaluate Candidate Malaria Vaccines

*Story from the NMRC Clinical Trials Center*

SILVER SPRING, MD. During National Nurses' Week, clinical nurses are recognized for their important role in patient care at hospitals and other treatment facilities. Research nurses at the Naval Medical Research Center Clinical Trials Center (NMRC CTC) play a critical role in the execution of studies that evaluate vaccines to protect the warfighter against militarily relevant infectious diseases. Clinical research nurses provide support for phase I vaccine trials conducted in the Infectious Diseases Directorate, NMRC. Phase I

clinical studies evaluate investigational vaccines being advanced towards licensure under the U.S. Food and Drug Administration (FDA). These research studies are conducted primarily to assess the safety and efficacy of novel candidate vaccine products in healthy human volunteers.

In the past year, NMRC CTC clinical research nurses provided clinical, laboratory and administrative support for a clinical study in which volunteers were immunized by mosquito bite with radiation attenuated sporozoites (IMRAS study).

Although immunization by mosquito bite would not be considered a feasible vaccine approach for a malaria vaccine for the military, it provides the opportunity to identify biomarkers of protection that could be used in designing a highly efficacious vaccine. The research samples from this study are currently being analyzed to identify such biomarkers and correlates of protection.

Our nurses are currently supporting two malaria vaccine trials: one clinical trial is evaluating the safety and efficacy of specific doses of the PfSPZ Vaccine, a whole *Plasmodium falciparum* sporozoite vaccine administered by direct venous inoculation in healthy volunteers. The second vaccine study will evaluate the safety and efficacy of



The NMRC CTC research nurses: from left to right: Ivelisse Padilla, Gail Whetle, RN, Jo Glenna Banania, RN

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# NMRC Commanding Officer's Message

**Happy Nurse's Week and Happy 108th birthday** to the over 4,200 uniformed and reserve Nurse Corps Officers and over 4,000 federal and contract nurses who support Navy Nurse Corps initiatives for Navy Medicine! In addition, I offer a special recognition to the 34 uniformed Navy Nurse Corps Nurse Researchers across Navy Medicine who support nursing research initiatives. We only comprise one percent of the Navy Nurse Corps but we are proud of our unique niche. "*What exactly is nursing research?*" is a question nurse researchers such as myself are occasionally asked, albeit less and less with each passing year. It's a good question although it always gives me pause for thought. Simply stated, nursing research is a scientific inquiry just like any other, with a focus on outcomes that inform policy and practice of interest to nurses or the patients they care for. I'm pleased to report we do have active research protocols in Navy R&D focused on improving nursing care to our beneficiaries. One example is the great work Cmdr. Abigail Yablonsky is continuing at the Naval Health Research Center where she assumed the Principal Investigator role for multidisciplinary nursing studies addressing nursing issues of gender differences in victims of sexual assault, a novel intervention to address circadian rhythm disruptions in shift-working nurses and hospital corpsmen, an inquiry to evaluate career outcomes in active duty military members with special needs children, and the continued work in conducting a systematic review of military women's health studies (page 3). These projects, funded by the TriService Nursing Research Program are the first of their kind to support nursing research in a research and development laboratory. Additional studies at NHRC that include nurse researchers on the teams are addressing issues related to the development of a self-diagnosis kit for deployed women, characterization of combat-related injuries in women during OIF and OEF, amputation injuries in deployed females, and early ketamine and opioids following serious combat injury as an intervention to reduce PTSD. A second example are the research nurses at the NMRC Clinical Trials Center who play critical roles in the execution of phase 1 clinical trial studies to evaluate investigational vaccines being advanced towards licensure under the FDA. NMRC nurses are heavily involved in all stages of vaccine studies from protocol development through to their final execution ( pg 1). Please enjoy this edition of the R&D newsletter!



NMRC Commanding Officer sends,  
Jacqueline D. Rychnovsky, CAPT, NC, USN

# NMRC-Asia Commanding Officer's Message

As tensions rise in the South China Sea it is imperative that the United States projects power into the region reassuring our strategic partners we remain committed to ensuring regional stability. This was recently evidenced by the port call in Singapore of the USS JOHN C STENNIS (CVN-74) and the additional escort ships that make up Carrier Strike Group 3 (CSG3). While in port I had the pleasure of attending the CSG3 Change of Command conducted on the flight deck. I was able to witness firsthand the immense power associated with 1,092 feet of mobile diplomacy. I felt a sense of pride that the U.S. Naval Medical Research Center-Asia and U.S. Naval Medical Research Unit-2 detachment in Cambodia are also key players in bringing stability and building partnerships throughout Southeast Asia.

Once again it is that time of year when our active duty researchers and support staff rotate to new duty stations throughout the world. Rotations can be difficult on all commands as we lose that corporate knowledge we've grown to appreciate and at times take for granted. Research projects pass hands and the expectation is the incoming scientists will continue to meet those milestones projected by their predecessors. Loss of personnel throughout our enterprise has the potential to be disruptive but I think possibly more so when it comes to the overseas laboratories due to limited uniformed assets. Nevertheless, I am always astounded by how the research continues and the mission gets executed during these annual periods of transition. I believe this reinforces the fact that our international partners and locally hired staff are such an integral part of our operations. It is imperative we build their skill set and fill their toolbox with the expertise to carry the torch once we have moved on. They often are the enduring corporate knowledge that help our incoming staff mitigate disruptions to mission execution thereby allowing us to continue to drive and project our soft power diplomacy throughout the region.



NMRC-Asia Commanding Officer sends,  
Marshall R. Monteville, CAPT, MSC, USN

# Cmdr. Abigail Marter Yablonsky, NC, USN - Lead on Several TSNRP-Supported Studies at NHRC

*Story courtesy of TSNRP Newsletter (Spring/Summer 2016), edited for space consideration.*

SILVERSPRING, MD. Cmdr. Abigail Marter Yablonsky, NC, has served for 19 years as an active duty Navy nurse. She is currently stationed at Naval Medical Center San Diego, works part-time as a family nurse practitioner, and is a research scientist in the Health and Behavioral Science Department at the Naval Health Research Center (NHRC) focusing on four of the lab's Triservice-Nursing Research Program (TSNRP) studies.

Yablonsky said she feels extremely privileged to be leading the research teams on these important studies, which, in many ways, reflect and expand beyond her initial inspiration to devote herself to providing comprehensive nursing care to patients and their families.

## The Phase II Congressional Military Women's Health Gap Study

The Phase II Congressional Military Women's Health Gap Study is an extension of work the TSNRP Military Women's Health Research Interest Group conducted to identify research related to the health of military women. This literature review covers 2000 to 2015 using a four-tiered process of review and analysis. The team continues to work on this study and plans to look at health care utilization data within large military databases to cross-check the results from the comprehensive literature review.

## Negative Work and Social Experiences during Military Service Study

Negative Work and Social Experiences during Military Service (the WiSE) Study was designed to better understand the contexts within which sexual assaults occur enabling more effective, targeted prevention measures. Using four years' worth of data from the Workplace and Gender Relations Survey, the team is performing a cluster analysis to identify groups of individuals whose sexual assault experiences share similar characteristics, which may break out differently across gender lines. In addition, the team is analyzing the data from the WiSE study's



*Cmdr. Abigail Marter Yablonsky at the Naval Health Research Center in San Diego, California*

online survey and will invite potential subjects to participate in further qualitative interviews, to gain deeper insight into the issues relating to sexual assault during military service.

## The Career and Health Outcomes of Military Personnel with Special Needs Children Study

The Career and Health Outcomes of Military Personnel with Special Needs Children study focuses on the unique needs of military families. Using large military databases, the research team is analyzing career and health outcomes of military personnel across three categories: (1) Military families with no children, (2) Military families with a special needs child, and (3) Military families with children who are not identified as having special needs. The team will conduct a survey of pediatric case managers working in all military treatment facilities in the continental United States in order to describe and assess variability in services offered to military families.

## Circadian and Sleep Health Interventions in Nurses and Hospital Corpsmen Study

The final project, which will begin this spring, is the Circadian and Sleep Health Interventions in Nurses and Hospital Corpsmen Study. This study aims to

examine the sleep-wake cycle, circadian hormone profiles, and cognitive function of nurses and corpsmen working on rotating shifts. The team will empirically test alternative sleep schedules and interventions to improve the performance of health care staff on rotating shifts.

Yablonsky added, since setting course 19 years ago, and further propelled by a TSNRP Graduate Award, she has traveled far to reach this point in her career. Now, with much gratitude and enthusiasm, she leads and supports her research teams on these valuable TSNRP-supported studies and looks forward to disseminating the research findings.

In the areas of military population health, NHRC's research teams examine the effects of deployments and career experiences on the overall physical and mental health of service members and their families. Behavioral science and epidemiology research and development focuses on a wide area which includes musculoskeletal injury prevention; substance abuse interventions; and studies in areas such as stress and mental health. The deployment health studies investigate the longitudinal health experiences of previously deployed military personnel and develop or evaluate appropriate health surveillance studies.

# Clinical Research Nurses at the NMRC Clinical Trials Center Forge Ahead to Evaluate Candidate Malaria Vaccines

(Continued from page 1)

a gene-based heterologous DNA prime adenovirus boost vaccine in healthy malaria naïve volunteers.

NMRC CTC research nurses contribute significantly to all stages of vaccine studies from protocol development through their final execution. The nurses play an important role in preparing critical study documents as part of human protocol packages for submission to the Institutional Review Board (IRB).

They are involved in reviewing and providing input to the protocol, generating case report forms, writing study specific procedures, creating informational briefs and distributing educational packets to volunteers who screen for the study.

While awaiting IRB approval, our research nurses work with the clinical study coordinators to ensure the site is fully prepared for the conduct of the study. Essential preparatory activities include the purchase of appropriate medical, pharmacologic, laboratory and administrative supplies and updating of standard operating procedures.

Clinical research nurses are major players in the execution of each study protocol. Once a protocol is approved, our clinical research nurses conduct the informed consent process with volunteers under the supervision of the research physician/principal investigator. Nurses provide clinical support to the principal investigator during the entire subject screening process by checking vital signs, collecting clinical samples by phlebotomy, tracking and dispositioning clinical research samples and running protocol-specific point of care laboratory

testing. Volunteers must fulfill medical eligibility criteria set forth by the protocol, as well as possess certain personal characteristics that enhance their chances for success. Our nurses significantly interact with volunteers during the screening process, and their input is highly sought by principal investigators who select the best volunteers to enroll in the studies.

Volunteers who are enrolled in the study undergo immunizations and follow-up visits according to the study protocol. During this period, research nurses administer immunizations under the direct supervision of research physicians, conduct clinical sample collections for safety and research laboratory studies, and perform telephone follow-ups according to the protocol.

NMRC malaria vaccine studies include a challenge during which volunteers are exposed to *Plasmodium falciparum* via mosquito bite to determine the protective efficacy of candidate vaccines. During this phase of the study, research physicians and nurses provided 24/7 clinical access to the volunteers. Our clinical research nurses closely monitor all of the volunteers, provide clinical care to those who are not protected and develop symptoms of malaria, collect clinical samples for safety and research testing, and administer antimalarial medications as ordered by research physicians.

The research nurses provide invaluable services and support at the NMRC CTC, forming an important pillar in the center's capability to conduct phase 1 vaccine studies. Through their hard work, experience and dedication, the NMRC CTC is poised to execute crucial studies to evaluate promising candidate malaria vaccines.



# Operationally Relevant Biomedical Research at Joint Task Force Bravo, Soto Cano, Honduras

*Story from U.S. Naval Medical Research Unit No. 6 Public Affairs*

LIMA, Peru. Researchers from the U.S. Naval Medical Research Unit No. 6 (NAMRU-6) conduct biomedical research in the field of infectious diseases and global health. This includes working with the U.S. forces deployed to Soto Cano Airbase in Honduras as part of Joint Task Force Bravo.

NAMRU-6's Bacteriology and Entomology Departments have ongoing projects looking at a range of pathogens which threaten the health of deployed U.S. forces.

Since 2014, the Bacteriology Department has developed a field laboratory at Soto Cano Airbase in support of Joint Task Force Bravo Force Health Protection. Surveillance activities include analysis of the rates and impact of travelers' diarrhea on military personnel's health during deployment, the enteric pathogens associated with travelers' diarrhea, and antibiotic resistance.

These efforts are not only important in determining the best course of treatment but aid in the development of vaccines and health interventions to prevent travelers' diarrhea and improve force health.

NAMRU-6 researchers recently completed a clinical trial in collaboration with the Naval Medical Research Center (NMRC). NAMRU-6 researchers worked with NMRC's Enterics Department and the Infectious Diseases Clinical Research Program (IDCRP) to optimize clinical practice guidelines for the treatment of travelers' diarrhea in deployed personnel.

Additionally, NAMRU-6 has teamed with USAF researchers at Wright-Patterson Air Base to determine if travelers' diarrhea during deployment changes normal intestinal bacteria (the microbiome) that may lead to further complications and also be a target for therapeutic products, such as probiotics.

NAMRU-6 is also conducting work on unexplained febrile illnesses that have



*Left to Right, Dr. Giselle Soto, Faviola Reyes Quan, Lt. Cmdr. Craig Stoops, Lt.Cmdr. Mark Simons and Dr. Mike Goodson (WPAB), part of the NAMRU-6 team conducting Force Health Protection related projects with JTF Bravo.*

been linked to new and emerging zoonotic viruses and pathogens transmitted primarily through the bites of ticks and mosquitoes. Occurrence of these diseases is linked to the distributions of the ticks and mosquitoes and their preferred mammalian host and humans.

Due to its geographic location, Honduras could potentially serve as a sentinel site where pathogens moving north from South America and across the SOUTHCOM AOR can be detected prior to their arrival and introduction into CONUS regions.

NAMRU-6 researchers have teamed with the Walter Reed Army Institute of Research's Walter Reed Biosystems Unit and the United States Army Medical Research Institute of Infectious Diseases to develop a joint study to identify vectors and vector-borne pathogens posing a threat to U.S. troops deployed to JTF-Bravo Honduras.

The main objective is the detection of etiological agents in vectors and those causing unexplained human health issues in troops and to use historical distribution data archives to guide force protection efforts.

The project will assess the current biodiversity, occurrence and prevalence of insect vectors and their respective pathogens in Honduras, and using a streamlined sample pathway and cutting-edge bio- and xeno-surveillance tools to develop highly specialized species-by-species risk models for vector-borne human diseases.

The main objective of all of NAMRU-6 projects, including these with JTF-Bravo, is to increase force health protection for all forward deployed military personnel. Collectively, these efforts support the health and care of deployed service members in SOUTHCOM, but have the potential to benefit our military personnel wherever they operate around the world.

# U.S. Navy is a Leader Developing Malaria Vaccine

Story by Dr. Eileen Villasante , Head, Malaria Department, and Capt. Judith Epstein, Clinical Director, Malaria Department, Naval Medical Research Center.

SILVER SPRING, Md. U.S. military forces are at great risk of developing malaria while deployed in endemic areas. In fact, more person-days were lost among U.S. military personnel due to malaria than to bullets during every military campaign fought in malaria-endemic regions during the 20th century.

Malaria is a serious and sometimes fatal disease caused by a parasite carried by the female *Anopheles* mosquito, which bites people. People who get malaria are typically very sick with high fevers, shaking chills, and flu-like illness and can be incapacitated for a couple of weeks.

There are five kinds of malaria parasites that infect people; *Plasmodium falciparum* is the type of malaria that is most likely to result in severe illness and is the major focus of malaria vaccine researchers at the Naval Medical Research Center (NMRC).

The mission of the NMRC Malaria Department is to develop a vaccine to prevent malaria in military personnel, which could compromise operational effectiveness, and in vulnerable populations for the benefit of global public health.

The malaria parasite is a complex organism with a complicated life cycle. The parasite has the ability to evade the immune system by constantly changing its surface, so developing a vaccine against these varying surfaces is very difficult.

Many scientists all over the world are working on developing an effective vaccine. Because other methods of fighting malaria including drugs, insecticides, and insecticide-treated bed nets, have not succeeded in eliminating the disease, the search for a vaccine is considered to be one of the most important research projects in public health.

We are developing and testing vaccines designed to induce strong protective antibody and/or cell-mediated immunity targeting the earliest stages of *P. falciparum* in the human body. These approaches are being pursued in close

## Three Challenges

- Military personnel, who are considered ‘malaria-naïve’ because they have never been exposed to malaria, routinely deploy to areas where malaria is endemic.
- The malaria parasite’s growing resistance to current drugs.
- The mosquito’s resistance to insecticides.

collaboration with military, government, academic, and biotechnology partners.

As an example, the NMRC research team has been advancing the development of an attenuated whole organism vaccine, which is not able to replicate (make more copies of itself). Many vaccines which are part of routine immunizations (measles, mumps and varicella) are examples of attenuated whole organism vaccines. The data supporting this approach for a malaria vaccine goes back decades to research done by DoD investigators and others in the early 1970’s.

During recent clinical studies the candidate vaccine was given to volunteers by direct

venous inoculation. Results have shown that the vaccine is easily administered, well-tolerated, gave high protective efficacy against malaria infection with a genetically unrelated *P. falciparum* strain, and could be administered in three doses.

From that success, we are now conducting a follow-on clinical trial of the vaccine to evaluate an improved dosing regimen designed to induce the high level of long-lasting (6-months or greater) broad protection that is required for a malaria vaccine to protect deployed military personnel. The clinical trial uses a genetically different malaria strain to challenge vaccinated volunteers. These data are critical to the development and licensure of a highly efficacious vaccine for the military and for vulnerable populations worldwide.

The World Health Organization estimates that in 2015, 214 million clinical cases of malaria occurred, and 438,000 people died of malaria, most of them children under 5 years of age in Africa. Because malaria causes so much illness and death, the disease is a great drain on many national economies. Since many countries with malaria are already among the poorer nations, the disease maintains a vicious cycle of disease and poverty.



*Malaria is a serious and sometimes fatal disease caused by a parasite carried by the female Anopheles mosquito, which bites people.*

# NAMRU-SA Announces Publication of a Book Chapter and Journal Article

Story courtesy of NAMRU-SA Public Affairs

SAN ANTONIO – Naval Medical Research Unit San Antonio (NAMRU-SA) announced the publication of a book chapter and a journal article based on studies for the detection and treatment of infectious agents conducted by Navy researchers in NAMRU-SA's Maxillofacial Injury and Disease department, at Joint Base San Antonio, Fort Sam Houston in San Antonio, Texas.

Maxillofacial, head, and neck traumas account for 16–36 percent of all combat-related injuries. Combat wounds have a high rate of contamination and quickly become infected with multiple types of microorganisms, including bacteria and viruses. Detection of these infections is limited by low sensitivity and time and labor requirements. Once diagnosed, treatment of combat-related infections is often complicated by the presence of multi-drug resistant organisms such as methicillin-resistant *Staphylococcus aureus* (*S. aureus*). Recent advances in the field of nanomaterials have led to the development of new technologies for improved diagnosis and treatment of infectious diseases.

"Laser-activated gold nanoparticles show promise as a new diagnostic and treatment modality for use alone or as an adjunct to existing technologies," says Dr. Nancy Millenbaugh, NAMRU-SA Principal Investigator and second author of Chapter 7, Enhancement of Pathogen Detection and Therapy with Laser-activated, Functionalized Gold Nanoparticles, in the new book published in April 2016, *Nanobiomaterials in Antimicrobial Therapy: Applications of Nanobiomaterials*, Volume 6, edited by Alexandru Mihai Grumezescu. Chapter

Original research to eradicate biofilm and improve treatment of multidrug-resistant infections, conducted by Navy scientists, at Naval Medical Research Unit San Antonio is published as Chapter 7 of the book, *Nanobiomaterials in Antimicrobial Therapy: Applications of Nanobiomaterials*, and an article in the Journal of Infection and Drug Resistance (right). Graphics are courtesy of NAMRU-SA Public Affairs.

7's third author, Dickson K. Kirui, Ph.D. is also a key researcher in NAMRU-SA's Maxillofacial Injury and Disease department. Millenbaugh and Kirui's research resulted in the development of a highly sensitive NanoLISA (Nanoparticle Linked Immunosorbent Assay) technique for rapid diagnosis of viruses and a laser-induced opto-acoustic technique for killing of bacteria. Targeted, laser-activated nanoparticles were able to enhance the detection of pathogenic agents

and mediate bactericidal effects through photomechanical or photothermal mechanisms.

The purpose of Volume 6 is to provide an overview of novel applications of nanomaterials in medicine, and Chapter 7 highlights the two novel nanomaterial-based technologies developed at NAMRU-SA for rapid diagnosis and killing of microbial agents.

**Infection and Drug Resistance**

 **ORIGINAL RESEARCH**

**Enzymatic degradation of in vitro *Staphylococcus aureus* biofilms supplemented with human plasma**

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**Abstract:** Enzymatic debridement is a therapeutic strategy used clinically to remove necrotic tissue from wounds. Some of the enzymes utilized for debridement have been tested against bacterial pathogens, but the effectiveness of these agents in dispersing clinically relevant biofilms has not been fully characterized. Here, we developed an *in vitro* *Staphylococcus aureus* biofilm model that mimics wound-like conditions and employed this model to investigate the antibiofilm activity of four enzymatic compounds. Human plasma at concentrations of 0%–50% was supplemented into growth media and used to evaluate biofilm biomass accumulation over 24 hours and 48 hours in one methicillin-sensitive and five methicillin-resistant strains of *S. aureus*. Supplementation of media with 10% human plasma resulted in the most robust biofilms in all six strains. The enzymes  $\alpha$ -amylase, bromelain, lysostaphin, and papain were then tested against *S. aureus* biofilms cultured in 10% human plasma. Quantification of biofilms after 2 hours and 24 hours of treatment using the crystal violet assay revealed that lysostaphin decreased biomass by up to 76%, whereas  $\alpha$ -amylase, bromelain, and papain reduced biomass by up to 97%, 98%, and 98%, respectively. Scanning electron microscopy confirmed that the dispersal agents detached the biofilm exopolysaccharide matrix and bacteria from the growth surface. Lysostaphin caused less visible dispersal of the biofilms, but unlike the other enzymes, induced morphological changes indicative of bacterial cell damage. Overall, our results indicate that use of enzymes may be an effective means of eradicating biofilms and a promising strategy to improve treatment of multidrug-resistant bacterial infections.

**Keywords:** MRSA,  $\alpha$ -amylase, bromelain, lysostaphin, papain

**Introduction**

*Staphylococcus aureus* is a leading cause of infection in military and civilian populations throughout the world. Wounds infected with *S. aureus* are especially difficult to treat due to the prevalence of multiple drug-resistant strains and proclivity for biofilm formation in this pathogen. Bacterial biofilms are complex, often multispecies microbial communities composed of cells that are enclosed in a self-produced exopolysaccharide (EPS) matrix and attached to a surface or to each other.<sup>1</sup> Biofilm formation confers multiple advantages for cell survival compared to planktonic growth, including protection from host immune defenses, shear stress, disinfectants, and antibiotics by the EPS matrix.<sup>1</sup> The barrier properties of the biofilm matrix also create an anoxic and low nutrient environment that induces cellular dormancy associated with multidrug tolerance, a transient and nonheritable phenotype that differs from classic mechanisms of antibiotic resistance.<sup>1</sup> The physically protected and antibiotic-tolerant population of cells within a biofilm is thought to act as a reservoir for recurrent infections in

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## Part II: The Mosquito Fighters: The Investigation on Thompson's Island

By André B. Sobocinski, Historian, BUMED

*When you ... arrive at Thompson's Island you will investigate with utmost care the origins, progress and present state of the sickness which prevails on the island and in the Squadron."*

~Secretary of the Navy Samuel Southard to Commodore John Rodgers, October 1823

**W**hen the United States acquired the Spanish colony of Florida in 1821, Key West was nothing more than a sleepy fishing village known as Cayo Huesa ("Bone Reef"). Seeing the strategic value of the property, the Navy took control over Key West in March 1822 and renamed it "Thompson's Island" in honor of the Secretary of the Navy, Smith Thompson.

For a time, Thompson's Island was the home of the Navy's West Indies Squadron

and its base of operations in a campaign against the last vestige of Caribbean pirates. It was not long however before disease overtook piracy as the greatest threat to the squadron. In 1823, Thompson's Island served as the site for one of the first military medical investigations into the cause of Yellow Fever.

The trouble began on August 19, 1823, when a Sailor from USS *Decoy* came ashore suffering muscle aches and gastrointestinal pain. The doctor on duty

found the Sailor's skin cool and clammy; his respiration short, his vomit black and "yellowness was diffused over his face, neck and breast."

The fever soon spread throughout the island. Within a week over 30 Sailors and Marines were stricken with Yellow Fever. Even Commodore David Porter, commander of the naval station, was reported to be in a "state of great debility."

(Continued on page 9)



Vintage sketch of Key West, Ca 1830s. Courtesy of the Naval History and Heritage Command

## Part II: The Mosquito Fighters: The Investigation on Thompson's Island



*Surgeon Bailey Washington, USN, one of three Navy physicians investigating the cause of Yellow Fever. Washington and his medical team identified temperature and ‘continued annoyance’ of mosquitoes and two of the likely causes. Courtesy of the Smithsonian American History Museum*

(Continued from page 8)

September 21, the new Secretary of the Navy, Samuel Southard reported to President James Monroe that 11 Sailors had died on Thompson's Island and at least 21 others, including the station's surgeons, were sick.

Southard ordered a special Navy mission to Thompson's Island to investigate the causes of the fever. Commodore John Rodgers, USN, would oversee the medical task force comprising three of the Navy's most accomplished physicians—Surgeons Thomas Harris, Richard K. Hoffman, and Bailey Washington. Each was assigned to Rodgers aboard USS *Shark*.

Rodgers and his medical task force arrived on the island October 23, 1823, only to discover that Commodore Porter and much of the station had fled. Of the 140 Sailors and Marines remaining, 59 were sick with fever, several of whom were being treated at the hospital under the care of Surgeon Thomas Williamson, USN. Rodgers noted that the fever had become quite mild but also the Sailors had become quite unruly in Porter's absence.

Surgeons Harris, Hoffman, and Washington walked the island studying every topographical feature and collected clues with the thoroughness of forensic scientists. They noted that over half the island was covered in salt water and fresh water ponds, the latter being covered with decomposing vegetable and animal matter; they suspected the resulting “miasma” (literally “bad air”) would have had a powerful effect on the populace and their health.

The surgeons drafted a report to Secretary Southard October 29 outlining six causes of Yellow Fever—sudden exposure to tropical climates; lack of comfortable quarters; intemperate habits; lack of fresh and wholesome provisions; “continued annoyance” by mosquitoes and sand-flies; and so-called “depressing passions,” arising from the prevailing epidemic.

Harris, Hoffman, and Washington had gone as far as medical science could without pinpointing the mosquito as the sole cause of the epidemic. More interesting, the surgeons noted that the disease only seemed to be present when the temperature exceeded fifty degrees. It could be argued they were just twelve degrees away from a significant breakthrough. Mosquitoes will not bite when the temperatures drop below 62 degrees Fahrenheit.

Although the fever on the island subsided as the weather cooled, at least 21 officers and an untold number of enlisted, died from the disease. The surgeons suggested that the fever would more than likely return to the island as the temperatures grew warmer.

President James Monroe later praised Commodore Rodgers and the “skilful” [sic] surgeons in his address to Congress in December 1823.

*The future of the naval station remained in question until another Yellow Fever epidemic lead to a string of agonizing deaths in 1824. May 24, 1825, Secretary Southard ordered Commodore Lewis Warrington, the new Commander of the West Indies Squadron, to relocate to a West Florida town called Pensacola. A year later, in December 1826, the Navy officially disestablished its base on Thompson's Island.*

# We All Have a Part in Eliminating Sexual Assault

B Lt. Cmdr. Lori Perry and Lt. Melissa Laird, Naval Health Research Center



During NHRC's recent Sexual Assault Awareness & Prevention Month (SAAPM) event, researchers presented findings from their studies that focused on sexual assault to raise awareness and share information with their colleagues on this topic. (U.S. Navy photo Released)

SAN DIEGO – In keeping with the theme for Sexual Assault Awareness and Prevention Month (SAAPM) “Eliminate Sexual Assault: Know Your Part, Do Your Part,” the Naval Health Research Center (NHRC) hosted two events to raise awareness about sexual assault and teach practical self-defense skills to staff.

SAAPM is intended to draw attention to the fact that sexual violence remains an intolerable violent crime which impacts mission readiness for the Navy community. Eliminating sexual assault requires every service member to be a steadfast participant in creating an appropriate and respectful culture and upholding Navy core values.

“Every service member, from the new recruit to the flag officer, must know, understand, and adhere to Navy core values and standards of behavior in order to eliminate sexual assault and other criminal behavior,” said Lt. Melissa Laird, a research physiologist at NHRC and one of the command’s points of contact for the Sexual Assault Prevention and Response (SAPR) Program.

## Know your Part

Knowledge is power. Being a research command, it was only fitting that staff at NHRC hosted a poster presentation to share research findings on the topic of sexual assault. This event provided researchers at the command, who are subject matter experts in this area, an opportunity to share information with their

colleagues from their own studies about this important topic.

“Spreading awareness is a major objective of SAAPM sponsored events,” said Laird. “This starts with knowing about the great research that is being conducted here at NHRC in a number of behavioral and psychological health areas to include sexual assault, resilience, and military workplace violence.”

## Do Your Part

The second event was a self-defense workshop, designed to teach the men and women at NHRC skills to fend off an attack, but more importantly, how to prevent one.

Sexual assault can happen to anyone, anywhere, at any time. Everyone has a role in ending sexual violence. Self-defense helps individuals become more aware of their surroundings and conscious of the fact that they do not have to feel helpless in any situation.

“The self-defense class was useful because it's not just about physically protecting yourself, but also knowing how to keep yourself out of dangerous situations,” said Lt. Cmdr. Lori Perry, preventive medicine physician at NHRC and command SAPR point of contact. “Situational awareness and how you carry yourself can be just as important as knowing how to physically ward off an attack.”

According to Laird, self-defense class participants often report feeling more prepared in case of a violent attack or a sexual assault. They also report feeling more empowered in everyday situations - like when walking at night. Self-defense teaches tips to reduce vulnerability to attack by making participants more aware of their surroundings and teaching them how to react to a variety of situations.

“The goal of self-defense is to provide participants with response options to an attack,” said Laird. “Parts of the class are geared specifically towards countering sexual assault. Research involving women who have survived sexual violence have shown that women who yelled, or used active physical resistance, were more likely to avoid a completed sexual assault.

Of those women who reported using physical resistance during an assault, a majority reported that they felt it either helped the situation or did not make the situation any worse.”

It is important to remember that sexual assault is never the victim's fault, even if they did not resist, adds Laird. “Only the perpetrator, the person who committed the crime of sexual assault, is at fault.”

## We All Play a Part in Preventing Sexual Assault

In addition to self-defense, an important component of preventing sexual assault is knowing when to act – when service members witness a crime or inappropriate behavior taking place, stepping in to prevent it can stop it.

“Each member of our Navy community has a unique role in preventing and responding to sexual assault. Bystander intervention is a key prevention approach, which involves interrupting situations that could lead to sexual assault, using both direct and indirect strategies.”

According to Laird, although sexual assault awareness and prevention is a year-round effort in the Navy, SAAPM is a

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# High School Dental Interns Tour Military Dental Clinic with Navy Dentists

Story Courtesy of NAMRU-SA Public Affairs



Judson High School Dental Interns in San Antonio, Texas, learn about the digital dental technology Navy dentists are using during a tour of the U.S. Army Budge Dental Clinic, Joint Base San Antonio, Fort Sam Houston, Texas. (Photos courtesy of NAMRU-SA Public Affairs)

SAN ANTONIO. A group of 13 dental interns from Judson High School in San Antonio visited the U. S. Army Budge Dental Clinic at Joint Base San Antonio, Fort Sam Houston, Texas, March 23.

The tour was coordinated by Dr. John Simecek, Head of the Naval Medical Research Unit—San Antonio's NAMRU-SA) Craniofacial Health and Restorative Medicine Directorate and lead by Cmdr. David Leal, one of two Navy dental officers at Budge. Leal is also a former researcher in NAMRU-SA's Craniofacial Directorate.

During the tour students learned military dentists provide all the same routine dental care as civilian dentists. "Dental problems like a toothache or oral condition can keep a Sailor or Marine from beginning fit to fight, which is vital to mission readiness," said Simecek.

To provide functional dental services to warfighters, the Navy utilizes cutting-edge dental technology like the intraoral camera and the new computer-aided design and

manufacturing (CAD/CAM) crown restoration technology.

Leal demonstrated the intraoral camera, a small video camera that takes an X-ray of the gum or tooth. Time-savings using the intraoral camera is noticeable when the dentist needs to take several X-rays at once. Intraoral camera images are easy to re-take, print and duplicate.

The Judson dental interns also got a chance to experience the time-saving benefit and esthetics of digital dentistry technology in action, as Navy dentist, Lt. Cmdr. Jason Hicks created a same-day crown with the new computer-aided design and manufacturing (CAD/CAM) restoration technology. CAD/CAM is increasingly being used by Navy dentists in military clinics and operational settings to mill a crown by computer while the patient waits, thus eliminating the second appointment and the temporary crown. The tour of Budge Dental Clinic is part-one of a two part exposure to Navy dentistry for the Judson dental interns.

"In part-two, students will have the opportunity to meet Navy research dentists at NAMRU-SA in the coming months and learn more about research dentistry as a career path," said Simecek.

The interns were accompanied by their teacher, program coordinator and founder of the Judson Dental Internship Program, Ms. Monica Nichols, a registered and certified dental assistant with over 10 years of experience. The Judson Dental Internship Program is a rigorous two year college level course Nichols established at Judson High school in 2010. Students take the course in their junior and senior year of high school.

"It was a pleasure to give the Judson dental interns a tour of our military dental clinic," said Leal. "Many of the interns want to become dentists and a few may even pursue dental research in the future. We were impressed by the program, the knowledge of the students, and the positive impact this program is having on the students career path and our local dental community."

# NMRC-Asia Scientists Join the Fight Against Zika Virus

By Lt. Cmdr. I.W. Sutherland, U.S. Naval Medical Research Center—Asia



One of U.S. Naval Medical Research Center -Asia Preventive Medicine Technicians, HM2 (FMF) Jason Ramirez, sorts mosquito specimens for identification and pathogen testing. Scientists at NMRC-A were recently awarded additional funding from the Defense Health Agency to conduct research on Zika virus in the region. (photo courtesy of NAMRU-A)

SINGAPORE. The U.S. Naval Medical Research Center - Asia (NMRC -A) team recently received funding from the Defense Health Agency's Global Emerging Infections Surveillance and Response System (GEIS) to support multiple investigations into Zika virus within the Bangladesh, Cambodia, and Laos and includes collaboration with the Pasteur Institute, Foundation

Merieux, and Erasmus Medical Center Rotterdam, among others.

Zika virus disease is spread to people primarily through the bite of an infected *Aedes* species mosquito.

February 1, 2016, the World Health Organization declared congenital abnormalities related to Zika virus a Public Health Emergency of International Concern.

NMRC-A's mission is to identify infectious disease threats of military and public health importance and develop and evaluate interventions and products to mitigate those threats. NMRC-A supports U.S. interests in the Pacific theater and advances diplomacy in the region. Scientists conduct infectious disease research and improve disease surveillance and outbreak response assistance for infectious diseases of critical public health importance to the United States and regional partners.

## NAMRU-Asia

NMRC-A was established in March 2013, as a new cooperative research initiative in Singapore by the Naval Medical Research Center in Silver Spring, Maryland, to work closely with distinguished Singaporean researchers with a focus on infectious disease research of mutual interest.



## We All Have a Part in Eliminating Sexual Assault

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time when both military and civilian sexual assault organizations engage their respective communities in these efforts.

"SAAPM provides an opportunity for the Sexual Assault Prevention and Response Team to address sexual violence by engaging the Navy community through awareness and prevention-focused events and activities," said Laird. "The events held throughout the Navy in April provide an opportunity not only to raise awareness and promote prevention, but also to challenge existing social norms and beliefs."

As the DoD's premier deployment health research center, NHRC's cutting-edge research and development is used to optimize the operational health and readiness of the nation's armed forces. In proximity to more than 95,000 active duty service members, world-class universities, and industry partners, NHRC sets the standard in joint ventures, innovation, and translational research.



NHRC hosted a self-defense workshop for Sexual Assault Awareness & Prevention Month (SAAPM) to teach men and women at the command skills to fend off an attack as well as how to prevent one. The goal was to help participants be more aware of their surroundings and feel more empowered in everyday situations. (U.S. Navy photo Released)

# Navy Medicine Honors U.S. Sea Services at Fiesta San Antonio

Story courtesy of NAMRU-SA Public Affairs

SAN ANTONIO—Navy Medicine ambassadors brought the U.S. Navy's presence in San Antonio to the forefront as they waved to crowds from the U.S. Sea Services float during the 75<sup>th</sup> annual Texas Cavaliers River Boat Parade in San Antonio, Texas, April 18. Naval Medical Research Unit-San Antonio (NAMRU-SA) helped launch Navy Fiesta activities by participating in the 97th Patriotic & Historical Ball and the River Boat Parade. In a city often referred to as "Military City USA" it is fitting that the River Boat Parade's 2016 theme "River of Champions" promotes the idea that *not all heroes wear capes*.

The River Boat Parade is a premier event of Fiesta San Antonio and a purpose driven parade that rallies the community to contribute over half a million dollars to support more than 51 children's charities in San Antonio.

Fiesta began in 1925 with the Pilgrimage to the Alamo in honor of the defenders of the Alamo who lost their lives in March 1836. It has been held every year since and is recognized as the third largest event of its type in the nation with the televised River Boat Parade reaching hundreds of thousands of viewers across the nation and helping launch the 10-day Fiesta celebration. Fiesta has always had a strong military participation and San Antonio



Navy Medicine ambassadors, Navy Band Southeast, and Navy ambassadors from Navy commands based in San Antonio engage the crowds along the San Antonio River walk and reaches hundreds of thousands of television viewers across the nation from their U.S. Military Sea Services float in the 75<sup>th</sup> annual Texas Cavaliers River Boat Parade as part of the Fiesta San Antonio. (Photo courtesy of NAMRU-SA Public Affairs)

Navy Week community events are held in conjunction with Fiesta. The River Boat Parade is one of several events that Navy Medicine commands participate in and share the Navy Medicine story in the San Antonio community during Fiesta.

NAMRU-SA's Commanding Officer, Capt. Montcalm-Smith accepted the Navy Week proclamation at the Bexar County, Texas courthouse April 18 while NAMRU

-SA Navy Officers helped San Antonio-based Navy Medicine commands kick off San Antonio Navy Week at the San Antonio Aquarium that same day. Navy Medicine's participation in Navy Week and Fiesta San Antonio programs give San Antonio families an opportunity to interact with Navy Medicine service members and learn about the role of Navy research to support warfighters health and survival.

## NAMRU-SA Announces Publication of a Book Chapter and Journal Article

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**Citation:** Glickman RD, Millenbaugh, NJ, Kirui DK, et al. (2016). Enhancement of Pathogen Detection and Therapy with Laser-Activated Functionalized Gold Nanoparticles. In AH Grumezsch (Ed.), *Nanobiomaterials in Antimicrobial Therapy: Applications of Nanobiomaterials, Volume 6* (pp.229-260). Cambridge, MA, USA: Elsevier.

Results from a NAMRU-SA study published April, 27, 2016, in the journal **Infection and Drug Resistance** indicates that use of enzymes may be an effective

means of eradicating biofilms and a promising strategy to improve treatment of multidrug-resistant bacterial infections.

NAMRU-SA's principal investigator for this study, Dr. Nancy Millenbaugh said "Successful treatment of combat-related maxillofacial infections is limited by the formation of biofilms, which contain an extracellular matrix that protects microorganisms against antibiotics and the host immune system. Use of enzymatic agents that degrade components of the biofilm may improve current therapeutic regimens. The purpose of this study was to

test the ability of four enzymes to disperse *Staphylococcus aureus* biofilms."

This study tested the ability of four enzymes to disperse *S. aureus* biofilms. The paper's first author is Lt. Chase M. Watters, staff scientist at Naval Medical Research Center, Silver Spring, Maryland.

**Citation:** Watters CM, Burton T, Kirui DK, Millenbaugh NJ, (2016) Enzymatic Degradation of In Vitro *Staphylococcus aureus* Biofilms Supplemented with Human Plasma. *Infection and Drug Resistance* 2016: 9.